

CLAIMS

What is claimed is:

1. A computer method for performing a seamless handoff of a mobile device from an initial access point to a target access point in a wireless local access network,
5 comprising the steps of:
 assigning session data to the initial access point to establish an initial connection from the mobile device through the initial access point to a roaming server;
 detecting a triggering event that initiates a transfer of the mobile device
10 from the initial access point to the target access point; and
 transferring assignment of the session data from the initial access point to the target access point to establish a target connection from the mobile device through the target access point to the roaming server based on the session data in response to the step of detecting the triggering event has occurred, enabling the
15 mobile device to use the session data to communicate with the target access point, such that the mobile device transfers seamlessly from the initial access point to the target access point.
2. The computer method of Claim 1, wherein the step of detecting the triggering event comprises detecting that the mobile device is moving out of range of the
20 initial access point and within range of the target access point.
3. The computer method of Claim 1, wherein the step of detecting the triggering event comprises determining that the target access point has a preferable level of congestion compared to a level of congestion for the initial access point.

4. The computer method of Claim 1, wherein the step of detecting the triggering event comprises determining that the target connection has a preferable level of connection quality compared to a level of connection quality for the initial connection.
- 5 5. The computer method of Claim 1, wherein:
the step of assigning the session data to the initial access point comprises
assigning an access point device address to the initial access point; and
the step of transferring assignment of the session data comprises
terminating the assigning of the access point device address to the initial access
10 point and assigning the access point device address to the target access point.
6. The computer method of Claim 1, wherein:
the initial connection is a first version of a point to point link between
the initial access point and the mobile device based on assigning the access point
device address to the initial access point; and
15 the target connection is a second version of the point to point link based
on assigning the access point device address to the target access point and re-
establishing the point to point link between the target access point and the
mobile device.
7. The computer method of Claim 1, further comprising a step of registering the
20 session data in a database.
8. The computer method of Claim 1, wherein the session data comprises the access
point device address and encryption data.

9. The computer method of Claim 1, further comprising a step of assigning a mobile device address to the mobile device, and wherein the session data includes the access point device address and the mobile device address.
10. The computer method of Claim 1, wherein the step of detecting the triggering event occurs in response to a transient situation affecting the initial access point; and further comprising a step of reassigning the session data to the initial access point to re-establish the initial connection after a termination of the transient situation.
11. The computer method of Claim 10, wherein the transient situation is one of a congestion of the initial access point and a decline of connection quality in the initial connection.
12. A system comprising a digital processor for performing a seamless handoff of a mobile device from an initial access point to a target access point in wireless local access network, the system comprising:
- 15 a gateway application executing on the digital processor for assigning session data to the initial access point to establish an initial connection from the mobile device through the initial access point to a roaming server; and
- a communications interface coupled with the gateway application for detecting a triggering event that initiates a transfer of the mobile device from the initial access point to the target access point; and
- 20 the gateway application transferring assignment of the session data from the initial access point to the target access point to establish a target connection from the mobile device through the target access point to the roaming server based on the session data, enabling the mobile device to use the session data to
- 25 communicate with the target access point, such that the mobile device transfers seamlessly from the initial access point to the target access point.

13. The system of Claim 12, wherein the triggering event is based on roaming of the mobile device and wherein the communication interface detects that the mobile device is moving out of range of the initial access point and within range of the target access point.
- 5 14. The system of Claim 12, wherein the triggering event is based on congestion in the wireless area network and wherein the communications interface determines that the target access point has a preferable level of congestion compared to a level of congestion for the initial access point.
- 10 15. The system of Claim 12, wherein the triggering event is based on connection quality and wherein the communications interface determines that the target connection has a preferable level of connection quality compared to a level of connection quality for the initial connection.
- 15 16. The system of Claim 12, wherein the session data includes an access point device address and the gateway application:
assigns the session data to the initial access point by making an assignment of the access point device address to the initial access point; and
transfers the session data by terminating the assignment of the access point device address to the initial access point and by assigning the access point device address to the target access point.
- 20 17. The system of Claim 12, wherein:
the initial connection is a first version of a point to point link between the initial access point and the mobile device based on assigning the access point device address to the initial access point; and
the target connection is a second version of the point to point link based

on assigning the access point device address to the target access point and re-establishing the point to point link between the target access point and the mobile device.

18. The system of Claim 12, wherein the gateway application registers the session
5 data in a database.
19. The system of Claim 12, wherein the session data comprises the access point device address and encryption data.
20. The system of Claim 12, wherein the gateway application assigns a mobile
10 device address to the mobile device, and wherein the session data includes the access point device address and the mobile device address.
21. The system of Claim 12, wherein the communication interface detects the
15 triggering event occurs in response to a transient situation affecting the initial access point; and the gateway application reassigns the session data to the initial access point to re-establish the initial connection after a termination of the transient situation.
22. The system of Claim 21, wherein the transient situation is one of a congestion of the initial access point and a decline of connection quality in the initial connection.
23. A computer program product that includes a computer usable medium having
20 computer program instructions stored thereon for performing a seamless handoff of a mobile device from an initial access point to a target access point in a wireless local area network, such that the computer program instructions, when performed by a digital processor, cause the digital processor to:

assign session data to the initial access point to establish an initial connection from the mobile device through the initial access point to a roaming server;

5 detect a triggering event that initiates a transfer of the mobile device from the initial access point to the target access point; and

transfer assignment of the session data from the initial access point to the target access point to establish a target connection from the mobile device through the target access point to the roaming server based on the session data in response to the step of detecting the triggering event has occurred, enabling the mobile device to use the session data to communicate with the target access point, such that the mobile device transfers seamlessly from the initial access point to the target access point.

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24. A method in a roaming server in a wireless local area network for performing a seamless handoff of a mobile device from an initial piconet having an initial access point to a target piconet having a target access point;

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assigning the mobile device associated with the initial access point a master role for the initial piconet;

assigning the target access point a slave role in the initial piconet while the target access point retains a master role in the target piconet; and

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establishing an association of the mobile device with the target piconet by switching roles of the mobile device and target access point, so that the mobile device establishes the association with the target piconet as a slave of the target piconet, and the target access point terminates the slave role of the target access point with the initial piconet, while the target access point maintains the master role in the target piconet, such that the mobile device transfers seamlessly from the initial piconet to the target piconet.

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25. The method of Claim 24, further comprising the step of assigning the initial access point that has the master role for the initial piconet a slave role in the initial piconet until the switching of the roles of the mobile device and target access point is completed, thereafter reassigning the initial access point for the initial piconet the master role for the initial piconet.
26. The method of Claim 24, further comprising the step of determining to initiate a transfer of the mobile device from the initial piconet to the target piconet by detecting an increased rate of packet loss for packets transmitted from the mobile device to the initial access point and by detecting that the mobile device is within range of the target access point.
27. A roaming server in a wireless local area network for performing a seamless handoff of a mobile device from an initial piconet having an initial access point to a target piconet having a target access point, the roaming server comprising:
- a communication interface for communicating with the initial access point and the target access point;
 - a digital processor coupled to the communication interface, the digital processor hosting and executing a gateway application that is configured to:
 - assign the mobile device associated with the initial access point a master role for the initial piconet;
 - assign the target access point a slave role in the initial piconet while the target access point retains a master role in the target piconet; and
 - establish an association of the mobile device with the target piconet by switching roles of the mobile device and target access point, so that the mobile device establishes the association with the target piconet as a slave of the target piconet, and the target access point terminates the slave role of the target access point with the initial

piconet, while the target access point maintains the master role in the target piconet, such that the mobile device transfers seamlessly from the initial piconet to the target piconet.

28. The roaming server of Claim 27, wherein the gateway application assigns the initial access point that has the master role for the initial piconet a slave role in the initial piconet until the switching of the roles of the mobile device and the target access point is completed, and thereafter reassigns the initial access point for the initial piconet the master role for the initial piconet.
29. The roaming server of Claim 27, wherein the gateway application determines to initiate a transfer of the mobile device from the initial piconet to the target piconet by detecting an increased rate of packet loss for packets transmitted from the mobile device to the initial access point and by detecting that the mobile device is within range of the target access point.
30. A computer program product that includes a computer usable medium having computer program instructions stored thereon for performing a seamless handoff of a mobile device from an initial piconet having an initial access point to a target piconet having a target access point, such that the computer program instructions, when performed by a digital processor, cause the digital processor to:
- assign the mobile device associated with the initial access point a master role for the initial piconet;
 - assign the target access point a slave role in the initial piconet while the target access point retains a master role in the target piconet; and
 - establish an association of the mobile device with the target piconet by switching roles of the mobile device and target access point, so that the mobile device establishes the association with the target piconet as a slave of the target

piconet, and the target access point terminates the slave role of the target access point with the initial piconet, while the target access point maintains the master role in the target piconet, such that the mobile device transfers seamlessly from the initial piconet to the target piconet.

- 5 31. A method in a roaming server for enabling seamless roaming of mobile devices among access points in a wireless local area network, comprising the steps of:
- establishing a host controller interface in the roaming server;
- encapsulating host controller commands in a packet-based network
- 10 network, the host controller commands directed to a connection session of the mobile device with the wireless local area network; and
- exchanging the encapsulated host controller commands with access points in the wireless area network to enable a mobile device to receive the host controller commands and maintain the connection session while roaming among
- 15 the access points.
32. The method of Claim 31, wherein the step of encapsulating the host controller commands comprises encapsulating each host controller command in an encapsulated packet based on the packet-based network protocol, and providing
- 20 a device address of a host exchanging each encapsulated packet, a sequence number for use in a series of encapsulated packets, and an acknowledgment number for use in acknowledging a previously transmitted encapsulated packet.
33. The method of Claim 31, wherein the packet-based network protocol is a user datagram protocol.
34. A roaming server comprising a digital processor for enabling seamless roaming
- 25 of mobile devices among access points in a wireless area network, comprising:

a host controller interface established in the roaming server;

a packet encapsulation module executing on the digital processor for encapsulating host controller commands in a packet-based network protocol for use in communication with access points in the wireless area network, the host controller commands directed to a connection session of the mobile device with the wireless local area network; and

a communications interface coupled with the digital processor for exchanging the encapsulated host controller commands with access points in the wireless area network to enable a mobile device to receive the host controller commands and maintain the connection session while roaming among the access points.

35. The roaming server of Claim 34, wherein the packet encapsulation module encapsulates each host controller command in an encapsulated packet based on the packet-based network protocol, and the packet encapsulation module provides a device address of a host exchanging each encapsulated packet, a sequence number for use in a series of encapsulated packets, and an acknowledgment number for use in acknowledging a previously transmitted encapsulated packet.

36. The roaming server of Claim 34, wherein the packet-based network protocol is a user datagram protocol.

37. A computer program product that includes a computer usable medium having computer program instructions stored thereon for enabling seamless roaming of mobile devices among access points in a wireless area network, such that the computer program instructions, when performed by a digital processor, cause the digital processor to:

establish a host controller interface in a roaming server;

encapsulate host controller commands in a packet-based network protocol for use in communication with access points in the wireless area network, the host controller commands directed to a connection session of the mobile device with the wireless local area network; and

5 exchange the encapsulated host controller commands with access points in the wireless area network to enable a mobile device to receive the host controller commands and maintain the connection session while roaming among the access points.

10 38. An encapsulated packet for encapsulating and communicating commands based on a host controller interface using a packet-based network protocol, the encapsulated packet comprising:

 a host controller command based on the host controller interface;
 device address of a host exchanging the encapsulated packet;
 a sequence number for use in a series of encapsulated packets; and
15 an acknowledgment number for use in acknowledging a previously transmitted encapsulated packet.

20 39. An encapsulated packet signal embodied in a propagated signal on a propagated medium, the encapsulated packet signal for encapsulating and communicating commands based on a host controller interface using a packet-based network protocol, the encapsulated packet signal comprising:

 a host controller command based on the host controller interface;
 device address of a host exchanging the encapsulated packet;
 a sequence number for use in a series of encapsulated packets; and
25 an acknowledgment number for use in acknowledging a previously transmitted encapsulated packet.